

(CAS) CAS Registry Number: 1332-42-1-4 (ASBESTOS); 12001-29-5 (CHRYSTOLITE); 17068-78-9 (ANTHOPHYLLITE); 13768-00-8 (ACTINOLITE); 12172-73-5 (AMOSITE); 12001-28-4 (CROCIDOLITE); 14567-73-8 (TREMOLITE)

(MAT) Material Name: \$\$\$ ASBESTOS \$\$\$

(FML) Chemical Formula: $Mg_3Si_2O_5(OH)_4$ (CHRYSTOLITE); $(Mg,Fe)_7Si_8O_{22}(OH)_2$ (ANTHOPHYLLITE); $(Fe,Mg)_7Si_8O_{22}(OH)_2$ (AMOSITE); $Na_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ (CROCIDOLITE); $Ca_2Mg_5Si_8O_{22}(OH)_2$ (TREMOLITE); $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ (ACTINOLITE) (IMEMDT 0003)(AWQCD* 0008)

(USS) Common Uses: IN COMBINATION WITH OTHER TEXTILES FOR FIREPROOF AND HEAT RESISTANT CLOTH. BY ITSELF OR COMBINED WITH OTHER MATERIALS FOR VALVE PACKINGS, GASKETS, BOILER LAGGING AND PIPE COVERING, PROTECTIVE CLOTHING, SHIELDING MATERIALS, AND AS AUTOMOTIVE BRAKE LININGS AND CLUTCH FACINGS. IN BUILDING INDUSTRY, TO MANUFACTURE ASBESTOS CEMENT PRODUCTS, HEAT INSULATING, AND FIREPROOFING MATERIALS. ABOUT 95% OF COMMERCIAL ASBESTOS IS CHRYSTOLITE. (AING** 0001) (AWQCD* 0008) TREMOLITE, ACTINOLITE, AND ANTHOPHYLLITE HAVE LITTLE COMMERCIAL IMPORTANCE. (USPEDU 0002)

(CON) Containers: CFR--ASBESTOS CEMENT, PLASTIC, ASPHALT, RESINS, OR MINERAL ORE; ASBESTOS-CONTAINING MANUFACTURED PRODUCTS; AND MATERIALS OR PRODUCTS WHOSE COMMERCIAL VALUE IS NOT DEPENDENT ON THEIR ASBESTOS CONTENT ARE NOT SUBJECT TO THE FOLLOWING REQUIREMENTS. COMMERCIAL ASBESTOS MAY BE TRANSPORTED IN RIGID, LEAKTIGHT PACKAGING SUCH AS METAL OR FIBER DRUMS, PORTABLE TANKS, HOPPER-TYPE RAIL CARS, OR HOPPER-TYPE MOTOR VEHICLES. BAGS OR OTHER NON-RIGID PACKAGING ARE SUITABLE WHEN TRANSPORTED IN CLOSED FREIGHT CONTAINERS, MOTOR VEHICLES, OR RAIL CARS THAT ARE LOADED BY AND FOR THE EXCLUSIVE USE OF THE CONSIGNOR AND UNLOADED BY THE CONSIGNEE. OTHERWISE, BAGS OR OTHER NON-RIGID PACKAGINGS MUST BE DUST AND SIFT-PROOF. IF TRANSPORTED OTHER THAN BY PRIVATE CARRIER BY HIGHWAY, SUCH NON-RIGID PACKAGES SHOULD BE PALLETIZED AND UNITIZED BY METHODS SUCH AS SHRINK-WRAPPING IN PLASTIC FILM OR WRAPPING IN FIBERBOARD SECURED BY STRAPPING. IF SECURED AND SUPPORTED ADEQUATELY TO PREVENT SHIFTING, PALLETS NEED NOT BE USED DURING TRANSPORT BY VESSEL FOR LOADS WITH SLINGS UNITIZED BY METHODS SUCH AS SHRINK WRAPPING. INSTEAD OF PALLETIZING OR UNITIZING, BAGS OR OTHER NON-RIGID PACKAGING THAT ARE DUST AND SIFT-PROOF MAY BE PACKED IN STRONG OUTSIDE FIBERBOARD OR WOODEN BOXES. (49CFR* 0001) IATA--ASBESTOS FIBERS MUST BE PACKED IN RIGID, AIRTIGHT PACKAGING SUCH AS METAL OR FIBER DRUMS OR IN BAGS OR OTHER NON-RIGID PACKING THAT ARE DUST OR SIFT-PROOF IN STRONG OUTSIDE FIBERBOARD OR WOODEN BOXES. (IARAD5 0002) IMCO--EFFECTIVELY CLOSED, SIFT-PROOF RECEPTACLES HAVE NO RECEPTACLE NET AND PACKAGE GROSS WEIGHT LIMITS, BUT THE PACKAGE GROSS WEIGHT FOR MULTIPLY, SIFT-PROOF BAGS IS 50 KG. (85EZAO 0001)

(HND) General Handling Procedures: INSOFAR AS PRACTICABLE, ASBESTOS SHALL BE HANDLED, MIXED, APPLIED, REMOVED, CUT, SCORED, OR OTHERWISE WORKED IN A WET STATE SUFFICIENT TO PREVENT THE EMISSION OF AIRBORNE FIBERS IN EXCESS OF THE PRESCRIBED EXPOSURE LIMITS. NO ASBESTOS CEMENT, MORTAR, COATING, GROUT, PLASTER, OR SIMILAR MATERIAL CONTAINING ASBESTOS SHALL BE REMOVED FROM BAGS, CARTONS, OR OTHER CONTAINERS IN WHICH THEY ARE SHIPPED, WITHOUT BEING EITHER WETTED, OR ENCLOSED, OR VENTILATED SO AS TO PREVENT EFFECTIVELY THE RELEASE OF AIRBORNE ASBESTOS FIBERS IN EXCESS OF THE PRESCRIBED LIMITS. (29CFR* 0001) MIX ASBESTOS CEMENT, MORTAR, COATINGS, GROUT, AND PLASTER IN CLOSED BAGS OR OTHER CONTAINERS. COLLECT AND DISPOSE OF ASBESTOS WASTE AND SCRAP IN SEALED BAGS OR OTHER CONTAINERS. USE VACUUM CLEANERS OR WET CLEANING METHODS TO CLEAN UP ASBESTOS DUST. DO NOT DRY SWEEP. (NIOAS* 0001)

(LDL) Detection Limit (Lab.; Techniques, Ref) (ppm): SEE REVIEW OF ANALYTICAL TECHNIQUES IN (AWQCD* 0008). THE MINERAL NATURE OF THE FIBERS IS GENERALLY DETERMINED WHEN NECESSARY BY ELECTRON BEAM INSTRUMENTATION (MORPHOLOGY, SELECTED AREA ELECTRON DIFFRACTION, AND ELECTRON MICROPROBE ANALYSIS). IN 1980, THE U.S. ENVIRONMENTAL PROTECTION AGENCY PROPOSED AN INTERIM METHOD FOR THE ANALYSIS OF ASBESTOS IN WATER: FILTER 50 TO 500 ML OF A 1-L SAMPLE THROUGH A 0.1 MICRON POLYCARBONATE FILTER. PLACE A PORTION OF THE FILTER ON AN ELECTRON MICROSCOPE GRID, COAT THE POLYCARBONATE FILTER WITH CARBON, DISSOLVE THE FILTER, AND SCAN BY TRANSMISSION ELECTRON MICROSCOPY AT 10,000 TO 20,000 MAGNIFICATION.

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IDENTIFY CHRYSOTILE BY MORPHOLOGY AND AMPHIBOLES BY SELECTED AREA ELECTRON DIFFRACTION. AMPHIBOLE MINERAL SPECIES CAN BE IDENTIFIED USING ENERGY-DISPERSIVE X-RAY ANALYSIS OF EACH FIBER. SENSITIVITY IS APPROXIMATELY 250,000 FIBERS PER LITER OR LESS IN MOST DRINKING WATER SYSTEMS. TWO GENERAL ELECTRON MICROSCOPIC TECHNIQUES ARE USED FOR ANALYSIS OF ASBESTOS IN AMBIENT AIR. ONE INVOLVES DIRECT TRANSFER OF ASBESTOS COLLECTED ON CELLULOSE ACETATE OR POLYCARBONATE FILTERS TO ELECTRON MICROSCOPE GRIDS. THE OTHER INVOLVES DISPERSING THE ASHED RESIDUE BY PHYSICAL MEANS AND ENMESHING IN A NITROCELLULOSE OR COLLOIDION FILM FOR MOUNTING ON ELECTRON MICROSCOPE GRIDS OR REFILTERING THROUGH A POLYCARBONATE FILTER. (AWQCD* 0008)

(STD) Standard Codes: SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LIST. NIOSH NO. C16475000. DOT--HAZARD CLASS ORM-C, NO IDENTIFICATION NO., NO REQUIRED LABEL, PACKAGING EXCEPTION AND SPECIFIC REQUIREMENTS IN 173.1090 (SYNOPSIS IS IN FIELD 14), NO PACKAGE WEIGHT LIMIT ON PASSENGER AIRCRAFT OR RAILCAR OR CARGO ONLY AIRCRAFT. STOW AND HANDLE TO AVOID AIRBORNE PARTICLES. (FEREAC 0017) IMCO--NO LABEL REQUIRED. BLUE ASBESTOS (CROCIDOLITE) IS IMCO CLASS 9 (MISCELLANEOUS DANGEROUS SUBSTANCES), UN2212, PACKAGING GROUP II. WHITE ASBESTOS (CHRYSOTILE) IS IMCO CLASS 9, UN2590, PACKAGING GROUP III. STOW ON OR UNDER DECK. (BSEZAO 0001) IATA--CLASS ORA.C. PACKAGES OF ASBESTOS FIBERS SHALL BE PLAINLY MARKED "ORA.GROUP C--ASBESTOS". NO WEIGHT LIMIT ON PASSENGER OR CARGO AIRCRAFT. (RARAD5 0002)

(FLM) Flammability: NONFLAMMABLE (CFCTS* 0001)

(PER) Persistency: ASBESTOS IS REFRACTORY IN THE AQUATIC ENVIRONMENT. BASED ON LABORATORY EXPERIMENTS, ASBESTOS IN WATER WILL STAY IN SUSPENSION FOR A LONG TIME. IT WILL REMAIN IN THE WATER COLUMN UNTIL SURFACE CHARGE COAGULATION OR CHANGES IN FLOW REGIME ALLOW IT TO SETTLE OUT OF THE SYSTEM. ASBESTOS FIBERS RELEASED TO THE AQUATIC ENVIRONMENT FROM THE DUMPING OF TACONITE TAILINGS INTO LAKE SUPERIOR HAVE TRAVELLED AT LEAST 75 MILES FROM THEIR POINT OF RELEASE (DETECTED IN DRINKING WATER IN DULUTH, MN). THE FIBERS ARE BEING COAGULATED AND SEDIMENTED IN THE WESTERN PART OF THE LAKE NEAR THE TAILING DELTA. IF THIS WERE NOT OCCURRING, THE CALCULATED CONCENTRATION WOULD BE 3.5 MILLION FIBERS PER LITER THROUGHOUT LAKE SUPERIOR. ACTUALLY, ONLY ONE MILLION FIBERS PER LITER ARE PRESENT IN EASTERN LAKE SUPERIOR. THE GREATER THE DISTANCE FROM THE TAILINGS, THE RICHER IN MAGNESIUM THE ASBESTOS BECAME. (USPEDU 0002)

(PFA) Potential for Accumulation: MINERAL FIBERS IDENTICAL TO THOSE IN THE WATER OF A RIVER WITH KNOWN CHRYSOTILE ASBESTOS CONTAMINATION AND IN LAKE SUPERIOR WATER CONTAMINATED WITH AMPHIBOLE FIBERS WERE FOUND IN TISSUE SAMPLES FROM THE RIVER AND LAKE TROUT, BROOK TROUT, AND CHANNEL CATFISH IN THE LAKE. CONCENTRATIONS IN THE MUSCLE WERE APPROXIMATELY ONE-TWELFTH THE AVERAGE WATER CONCENTRATIONS (BY VOLUME). LIVER AND KIDNEY FIBER CONCENTRATIONS WERE 500 TIMES GREATER THAN MUSCLE TISSUE CONCENTRATIONS. (AWQCD* 0008)

(CAG) Carcinogenicity: ALL TYPES OF COMMERCIAL ASBESTOS FIBERS TESTED IN MICE, RATS, HAMSTERS, AND RABBITS HAVE PROVED TO BE CARCINOGENIC. THEY PRODUCED MESOTHELIOMAS AND LUNG CARCINOMAS AFTER INHALATION AND AFTER INTRAPERITONEAL, INTRATRACHEAL, AND INTRAPLEURAL ADMINISTRATION. A HIGH INCIDENCE OF LUNG CANCER IS ASSOCIATED WITH OCCUPATIONAL EXPOSURE. (2CARC* 0001) STUDIES IN ANIMALS AND HUMANS SUPPORTING THE CARCINOGENICITY OF ASBESTOS FROM INGESTION AND INHALATION ARE CRITICALLY REVIEWED IN "AMBIENT WATER QUALITY CRITERIA FOR ASBESTOS" (AWQCD* 0008). EARLIER REVIEWS INCLUDE THOSE PUBLISHED BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) IN 1977 (IMEMOT 0013) AND IN 1973 (IMEMOT 0003). IARC SUMMARIZED IN ITS 1977 REPORT AS FOLLOWS: THE INCIDENCE OF TUMORS IS INFLUENCED BY THE SIZE AND SHAPE OF THE FIBERS. FIBERS LESS THAN 0.5 .MU.M IN DIAMETER ARE MORE ACTIVE IN PRODUCING TUMORS. OCCUPATIONAL EXPOSURE TO CHRYSOTILE, AMOSITE, ANTHOPHYLLITE, AND MIXED FIBERS CONTAINING CROCIDOLITE HAS RESULTED IN A HIGH LUNG CANCER INCIDENCE. AN INCREASED INCIDENCE OF LUNG CANCER HAS ALSO RESULTED FROM EXPOSURE TO PREDOMINANTLY TREMOLITIC MATERIAL MIXED WITH ANTHOPHYLLITE AND SMALL AMOUNTS OF CHRYSOTILE. PLEURAL AND PERITONEAL MESOTHELIOMAS FOLLOW OCCUPATIONAL EXPOSURE TO CROCIDOLITE, AMOSITE, AND CHRYSOTILE. GROUPS EXPOSED TO AMOSITE, CHRYSOTILE, OR MIXED FIBERS CONTAINING CROCIDOLITE SHOW AN EXCESS RISK OF GASTROINTESTINAL TRACT CANCERS. EXCESS

CANCERS OF THE LARYNX HAVE ALSO BEEN OBSERVED IN EXPOSED WORKERS. INDIVIDUALS LIVING IN THE NEIGHBORHOOD OF ASBESTOS FACTORIES AND CROCIDOLITE MINES AND IN HOUSEHOLDS CONTACTING ASBESTOS WORKERS ALSO DEVELOP MESOTHELIOMAS. (IMEMDT 0013) ANTHOPHYLLITE IS THE ONLY COMMERCIAL TYPE OF ASBESTOS NOT ASSOCIATED WITH INDUCTION OF MESOTHELIOMA. CIGARETTE SMOKING ENHANCES THE RISK OF DEVELOPING BRONCHOGENIC CANCER IN WORKERS EXPOSED TO ASBESTOS. NO ASSOCIATION HAS BEEN DEMONSTRATED BETWEEN CIGARETTE SMOKING AND DEVELOPMENT OF MESOTHELIOMA. (SATCA* 0001) OF PERSONS WHO HAVE BEEN HEAVILY EXPOSED TO ASBESTOS, 35 TO 44% MAY DIE OF ASBESTOS-RELATED CANCERS, WHEREAS ONLY ABOUT 8 TO 9% WOULD BE EXPECTED TO DIE OF CANCER HAD THEY NOT BEEN EXPOSED. ASBESTOS-RELATED CANCERS APPEAR TO BE 20 TO 25% LUNG CANCER, 7 TO 10% PLEURAL OR PERITONEAL MESOTHELIOMA, AND 8 TO 9% GASTROINTESTINAL CANCER. (DOSS** 1,81/MEI)

(MUT) Mutagenicity: THE PASSIVE INCLUSION OF ASBESTOS IN CULTURE MEDIA OF CHO-K1 CHINESE HAMSTER CELLS GAVE BOTH POSITIVE TRANSFORMATION OF MORPHOLOGY AND POSITIVE GENETIC RESPONSES, (THE RESULTS WERE SIMILAR FOR VERY FINE FIBROUS GLASS.)CHEMICALLY LEACHED ASBESTOS FIBERS PRODUCED FEWER ABNORMALITIES THAN DID UNTREATED FIBERS. NO MUTAGENICITY WAS OBSERVED IN TESTS OF SAMPLES OF CHRYSOTILE, AMOSITE, ANTHOPHYLLITE, AND SUPERFINE CHRYSOTILE WITH SEVERAL STRAINS OF ESCHERICHIA COLI AND SALMONELLA TYPHIMURIUM BACTERIA. (AWQCD* 0008)

(TER) Teratogenicity: TRANSPLACENTAL TRANSFER OF ASBESTOS HAS BEEN REPORTED. (AWQCD* 0008) SCHNEIDER AND MAURER (1977) FOUND NO TERATOGENIC EFFECTS AFTER FEEDING MICE UP TO 143 .MU.G CHRYSOTILE ASBESTOS PER MILLILITER DRINKING WATER. SOME DECREASE IN POSTIMPLANTATION SURVIVAL FOLLOWED BLASTOCYST EXPOSURE TO CHRYSOTILE ASBESTOS. (CTAGDB 0001)

(INT) Inhalation Limit (Text): REGULATIONS--
 OSHA PEL (TWA) 2 FIBERS >5 .MU.M/CM3 (29CFR* 1910)
 OSHA CEILING 10 FIBERS >5 .MU.M/CM3 (29CFR* 1910)
 RECOMMENDATIONS--
 NIOSH CEILING 500000 FIBERS >5 .MU.M/M3/15 MIN (CRSOE* 77-169,77/NIOSH)
 NIOSH TWA 100000 FIBERS >5 .MU.M/M3/15 MIN (CRSOE* 77-169,77/NIOSH)
 ACGIH SUSPECT CARCINOGEN (TLVADH 83/ACGIH)
 ACGIH TLV (TWA) 2 FIBERS >5 .MU.M/CM 3 (OTHER FORMS) 0.5 FIBER >5 .MU.M/CM3 (AMOSITE) 2 FIBERS >5 .MU.M/CM3 (CHRYSOTILE) 0.2 FIBER >5 .MU.M/CM3 (CROCIDOLITE)\\(TLVADH 83/ACGIH)
 UPDATED 3/84.

(DRC) Direct Contact: EXPOSURE TO ANY OF THE FORMS OF ASBESTOS CAN PRODUCE IRRITATION OF THE NOSE, THROAT, AND EYES. (CICIS* 0001)

(JNS) General Sensation: SHORT-TERM BREATHING OF HIGH CONCENTRATIONS OF ASBESTOS DUST MAY CAUSE TEMPORARY BREATHING DIFFICULTIES. (AWQCD* 0008)

(SAF) Personal Safety Precautions: FOR EXPOSURES THAT EXCEED ALLOWABLE LIMITS BY 100 TIMES, USE A TYPE "C" CONTINUOUS FLOW OR PRESSURE-DEMAND SUPPLIED-AIR RESPIRATOR. FOR EXPOSURES EXCEEDING THE LIMITS (CEILING OR TIME-WEIGHTED AVERAGE) BY TEN TO 100 TIMES, USE A POWERED AIR PURIFYING RESPIRATOR. FOR EXPOSURES UP TO TEN TIMES THE PERMISSIBLE LIMIT, USE A REUSEABLE OR SINGLE-USE AIR-PURIFYING RESPIRATOR. CONTAMINATED CLOTHING TO BE LAUNDERED SHOULD BE PUT IN SEALED BAGS AND LABELLED. (JSAFH* 0001) (29CFR* 0001) SPECIAL CLOTHING SUCH AS COVERALLS OR SIMILAR "HOLE BODY CLOTHING, HEAD COVERINGS, GLOVES, AND FOOT COVERINGS ARE REQUIRED BY OSHA FOR EMPLOYEES EXPOSED TO ASBESTOS FIBER CONCENTRATIONS THAT EXCEED THE CEILING LEVEL. (29CFR* 0001)

(AHL) Acute Hazard Level: ACCORDING TO A 1980 REVIEW PUBLISHED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY, ACUTE EFFECTS FROM INHALING HIGH CONCENTRATIONS OF ASBESTOS DUST ARE OF LITTLE CONSEQUENCE EXCEPT FOR TEMPORARY BREATHING DIFFICULTY. ACCORDING TO THE 1972 NIOSH CRITERIA DOCUMENT ON ASBESTOS, "THE EFFECT AFTER SEVERAL DECADES OF A ONE-TIME ACUTE DOSE OF LIMITED DURATION WHICH OVERWHELMS THE CLEARING MECHANISM, AND IS RETAINED IN THE LUNGS, MAY BE AS HARMFUL AS THE CUMULATIVE EFFECT OF LOWER DAILY DOSES OF EXPOSURE OVER MANY YEARS OF WORK". (NIOAS* 0001) ACCORDING TO THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION, INHALATION OF THE DUST OF ASBESTOS FIBERS IS DANGEROUS AND EXPOSURE SHOULD BE AVOIDED AT ALL TIMES. CROCIDOLITE (BLUE ASBESTOS) SHOULD BE REGARDED AS THE MOST HAZARDOUS TYPE OF ASBESTOS. (85EZAO 0001)

(CHL) Chronic Hazard Level: LONG CONTINUED INHALATION OF ASBESTOS DUST

RESULTS IN ASBESTOSIS, A FORM OF PNEUMOCONIOSIS. THE PRIMARY EFFECT OF INHALATION IS AN INTERSTITIAL PULMONARY FIBROSIS. THE DISEASE IS CHARACTERIZED BY ASBESTOS BODIES IN THE LUNGS AND SPUTUM. ASBESTOSIS CAN BE CLASSIFIED AS MINIMAL, MODERATE, AND ADVANCED BASED ON X-RAY EXAMINATION. IT REMAINS NONDISABLING FOR MANY YEARS IN MOST CASES. AN INCREASED INCIDENCE OF LUNG CANCER IN PERSONS WITH ASBESTOSIS HAS BEEN REPORTED. (AIHG** 0001)

(HEL) Degree of Hazard to Public Health: THERE DOES NOT APPEAR TO BE ANY CANCER RISK TO THE GENERAL PUBLIC FROM ASBESTOS IN AIR, WATER, BEVERAGES, FOOD, OR IN FLUIDS USED FOR ADMINISTRATION OF DRUGS. ASBESTOSIS AND PULMONARY CARCINOMA IN HUMAN BEINGS HAVE CONSISTENTLY BEEN ASSOCIATED ONLY WITH HEAVY INDUSTRIAL CONTACT WITH ASBESTOS. (SATCA* 0001)

(AML) In Situ Amelioration: SEEK PROFESSIONAL ASSISTANCE FROM EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. (201)321-6660. CONTAIN AND ISOLATE SPILL TO LIMIT SPREAD. CONSTRUCT A CLAY/BENTONITE SWALE TO DIVERT UNCONTAMINATED PORTION OF WATERSHED AROUND CONTAMINATED PORTION. ISOLATION PROCEDURES INCLUDE CONSTRUCTION OF BENTONITE LINED DAMS, INTERCEPTOR TRENCHES, OR IMPOUNDMENTS. IF DISPERSED IN WATER, COLLECT ASBESTOS BY FILTRATION. (85FEAY 0001) CONTAMINATED SOIL OR IMMOBILIZED RESIDUES MAY BE PACKAGED FOR DISPOSAL. CONFIRM ALL TREATMENT PROCEDURES WITH RESPONSIBLE ENVIRONMENTAL ENGINEER AND REGULATORY OFFICIALS.

(DIS) Disposal Methods: ASBESTOS WASTE MAY BE DISPOSED OF IN A CLASS I OR II LANDFILL AS A BULK MATERIAL. (85FEAY 0001) (RMRNR* 0002) BURN IN AN OPEN FURNACE OR CLOSED FURNACE WITH AFTER BURNER, WHICH PROBABLY DESTROYS MICROCRYSTALLINE STRUCTURES. (THIDD6 0002) ALTERNATIVELY, PACKAGE AND RETURN TO ORIGINATOR FOR RECOVERY AND RESALE.

(LOC) Probable Location and State of Material: ASBESTOS IS A FIBROUS MAGNESIUM CALCIUM SILICATE THAT OCCURS IN VARIOUS COMBINATIONS AS WHITE, GRAYISH, OR GREENISH MASSES, EITHER COMPACT OR OF LONG SILKY FIBERS, FLAX-LIKE AND READILY SEPARATED. (AIHG** 0001) ASBESTOS INTRODUCED TO SURFACE WATERS WILL REMAIN SUSPENDED UNTIL PHYSICAL DEGRADATION OR CHEMICAL COAGULATION ALLOWS IT TO SETTLE INTO THE SEDIMENT LAYER. (USPEDU 0002)

(HOH) Water Chemistry: MINERALOGICALLY STABLE, ASBESTOS IS NOT SUBJECT TO SIGNIFICANT CHEMICAL OR BIOLOGICAL DEGRADATION IN THE AQUATIC ENVIRONMENT. (USPEDU 0002) CHRYSOTILE IS THE MOST SUSCEPTIBLE ASBESTOS MINERAL TO ACID ATTACK, BEING ALMOST COMPLETELY DESTROYED WITHIN ONE HOUR IN ONE NORMAL HYDROCHLORIC ACID AT 95 DEGREES CELSIUS. THE AMPHIBOLE FIBERS ARE MUCH MORE RESISTANT TO MINERAL ACIDS. UP TO APPROXIMATELY 100 DEGREES CELSIUS, ASBESTOS FIBERS RESIST ATTACK BY OTHER REAGENTS BUT DETERIORATE RAPIDLY AT HIGHER TEMPERATURES. CONCENTRATED POTASSIUM HYDROXIDE AT 200 DEGREES CELSIUS WILL COMPLETELY DECOMPOSE CHRYSOTILE. (AWQCD* 0008) AT 5 TO 45 DEGREES CELSIUS, THE RATE OF THE DISSOLUTION OF CHRYSOTILE IS DIRECTLY PROPORTIONAL TO THE SPECIFIC SURFACE AREA OF THE ASBESTOS MINERALS. THE RATE OF DISSOLUTION OF MAGNESIUM FROM THE CHRYSOTILE IS RELATED TO THE PH AND IS FASTER WITH SMALLER PARTICLE SIZE. AT 25 DEGREES CELSIUS, THE ACTIVITY PRODUCT FOR CHRYSOTILE IN WATER IS $10^{-51.0}$. IN DISTILLED WATER AND AT BODY TEMPERATURE, AMOSITE AND CROCIDOLITE ARE INERT. AFTER TWO MONTHS OF LEACHING UNDER THESE CONDITIONS, 1,000 μMOL MAGNESIUM PER GRAM ASBESTOS HAD BEEN LEACHED. (USPEDU 0002) ASBESTOS DOES NOT HAVE AN ADSORPTIVE AFFINITY FOR USUALLY OCCURRING SOLIDS OF NATURAL WATER SYSTEMS. (TRACE MINERALS AND ORGANIC COMPOUNDS HAVE AN AFFINITY FOR ASBESTOS.) A SUSPENSION OF CHRYSOTILE ASBESTOS IN THE PRESENCE OF TRACE METALS WILL PERSIST UNTIL SUFFICIENT MAGNESIUM HAS LEACHED FROM THE CHRYSOTILE TO DEGRADE THE SUSPENSION. (USPEDU 0002)

•(CAS) CAS Registry Number: 7439-92-1
(SIC) SIC Code: 3693; 3562; 2816; 3323; 3691
(MAT) Material Name: LEAD
(FML) Chemical Formula: Pb
(USS) Common Uses: X-RAY PROTECTION; PAINT PIGMENT; BEARING METAL AND ALLOY
STEEL BATTERIES
(BIN) Binary Reactants: HYDROGEN PEROXIDE, ZIRCONIUM,
(SGM) Synergistic Materials: AS DISSOLVED OXYGEN LEVELS DECREASE LEAD
BECOMES MORE TOXIC TO FISH. SOFT WATER ALSO INCREASES TOXICITY.
(ANT) Antagonistic Materials: THE CHARACTERISTICS OF WATER SOFT OR HARD THAT
APPEAR TO BE CONDUCTIVE TO PLUMBO-SOLVENCY INCLUDE COMPARATIVE ABSENCE OF
CA AND MG BICARBONATES, LOW PH, HIGH DISSOLVED OXYGEN AND HIGH NITRATE
CONTENT. INSOLUBLE LEAD IS NOT HIGHLY TOXIC TO FISH. LEAD IS MORE TOXIC
IN SOFT WATER. 50 PPM CA HAS DESTROYED THE TOXIC EFFECT OF 1 PPM LEAD.
(FDL) Detection Limit (Field; Techniques, Ref) (ppm): .05, LEAD, (BNW10*
0006)
(LDL) Detection Limit (Lab.; Techniques, Ref) (ppm): .05, LEAD, (BNW10* 0006)
(STD) Standard Codes: NFPA - 3,2,-; ICC, USCG - NO.
(FLM) Flammability: MODERATE IN FORM OF DUST EXPOSED TO HEAT OR FLAME.
(TCP) Toxic Combustion Products: WHEN HEATED EMITS HIGHLY TOXIC FUMES. ENTER
WITH GREAT CARE.
(EXP) Explosiveness: MODERATE IN FORM OF DUST EXPOSED TO HEAT OR FLAME.
REACTIVE AT HIGH TEMPERATURE AND PRESSURE; CAN REACT VIGOROUSLY WITH
OXIDIZING MATERIALS.
(MLT) Melting Point (C.): 327.4
(BLP) Boiling Point (C.): 1740
(SPG) Specific Gravity: 11.34
(VPN) Vapor Pressure (mm Hg): 1; 1; 5; 10; 100
(PER) Persistency: WILL SLOWLY BE PRECIPITATED BY NATURAL CARBONATES.
(PFA) Potential for Accumulation: ACCUMULATES IN BONES. POSITIVE.
CONCENTRATION FACTORS FOR LEAD - MARINE AND FRESHWATER PLANTS AND
INVERTEBRATES 200 AND FISH - 60 (-170). HALF-LIFE IN TOTAL HUMAN BODY -
1460 DAYS (R172** 0001).
(CAG) Carcinogenicity: NEGATIVE. NO TUMORIGENIC EFFECTS NOTED IN RODENTS
ADMINISTERED 25 MG/L PB IN DRINKING WATER (R120** 0001).
(MUT) Mutagenicity: POTENTIAL. CHROMOSOME DAMAGE HAS BEEN NOTED FOR LEAD IN
OCCUPATIONALLY EXPOSED PERSONS (R120** 0001).
(TER) Teratogenicity: 1 PPB TOXIC TO 24-32% OF CHICK EMBRYOS (XMRNB 0002).
POTENTIAL.
(TRT) Major Species Threatened: ALL LIFE
(INH) Inhalation Limit (value): .15
(INT) Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) .05 MG/M3
(29CFR* 1910). RECOMMENDATIONS-- NIOSH TWA <.100 MG/M3 (CRSOE* 78-
158,78/NIOSH) ACGIH TLV (TWA) .15 MG/M3 (TLVADM 83/ACGIH) ACGIH STEL .45
MG/M3/15 MIN (TLVADM 83/ACGIH)
(JNS) General Sensation: COMPOUNDS CAN BE ABSORBED THROUGH SKIN AT TOXIC
CHRONIC LEVELS. SYMPTOMS INCLUDE PICA, ANOREXIA, VOMITING, MALAISE AND
CONVULSIONS. MAY LEAVE PERMANENT BRAIN DAMAGE.
(DHI) Direct Human Ingestion (mg/kg): 15
(SAF) Personal Safety Precautions: WEAR FILTER MASK.
(AHL) Acute Hazard Level: THRESHOLD CONCENTRATION FOR FRESH AND SALT WATER
FISH, .1 PPM (E188** 0001). .2 GM LEAD/KG BODY WEIGHT CAUSED DEATH WITHIN
A FEW DAYS IN CALVES. BACTERIAL DECOMPOSITION OF ORGANIC MATTER IS
INHIBITED BY .1 PPM LEAD. LOBSTERS DIED IN 20 DAYS WHEN KEPT IN LEAD
LINED TANKS. REPORT OF CHRONIC LEAD POISONING AMONG ANIMALS BY 1.8 PPM OF
LEAD IN SOFT WATER. LEAD COMPOUNDS ARE HIGHLY TOXIC IF INGESTED OR
INHALED. LEAD METAL IS AN INHALATIVE HAZARD.
(CHL) Chronic Hazard Level: MORE OF A CHRONIC PROBLEM THAN ACUTE.
APPLICATION FACTOR TO CONVERT 96 HOUR LC50 TO CHRONIC SAFE LIMIT - .013
BROOK; LEAD METAL IS A CHRONIC HAZARD VIA INGESTION OR INHALATION. TROUT,
.043 FOR RAINBOW TROUT. (R131** 0001) DEFORMITY AND SUB-ADULT MORTALITY
HAS BEEN NOTED IN TROUT EXPOSED TO .012-.14 PPM PB FOR 19 MONTHS AND 18
DAYS; CHRONIC POISONING SYMPTOMS INCLUDE, WEIGHT LOSS, WEAKNESS, AND

ANEMIA. RESPECTIVELY. (R182** 0001) FRESHWATER SHOULD NOT EXCEED .03 PPM
PB AND MARINE WATERS 1/50 OF 96 HOUR LC50. (R184** 0001) DAPHNID
REPRODUCTION REDUCED 16% FROM 3 WEEKS EXPOSURE TO .030 PPM PB. (JFRBAK
0010); ADMINISTRATION OF 25 MG/L PB IN DRINKING WATER LED TO RAPID DIE-
OFF OF BREEDING COLONIES OF MICE AND RATS (R120** 0001).

(HEL) Degree of Hazard to Public Health: LEAD IS AN ACUTE INHALATIVE TOXIN
AND A CHRONIC INGESTIVE AND INHALATIVE TOXIN. COMPOUNDS ARE GENERALLY
MORE TOXIC DUE TO SOLUBILITY. LEAD COMPOUNDS CAN ALSO BE ABSORBED THROUGH
SKIN AT HIGHLY TOXIC LEVELS.

(AIR) Air Pollution: HIGH

(ACT) Action Levels: ATTEMPT TO SUPPRESS SUSPENSION OF DUSTS.

(AML) In Situ Amelioration: ADD LIME TO PRECIPITATE BASIC LEAD CARBONATE.
POSSIBLE TO ADD COMPLEXING AGENT (EDTA) AND ADSORB ON CARBON. SEEK
PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S
ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

(AVL) Availability of Countermeasure Materials: LIME - CEMENT PLANTS
COMPLEXANTS - DETERGENT MANUFACTURERS, ANALYTICAL LABS; CARBON - WATER
TREATMENT PLANTS, SUGAR REFINERIES.

(DIS) Disposal Methods: ROUTE TO METAL SALVAGE FACILITY.

(IFP) Industrial Fouling Potential: TRACES OF LEAD IN METAL-PLATING BATHS
WILL AFFECT THE SMOOTHNESS AND BRIGHTNESS OF DEPOSITS.

(WAT) Major Water Use Threatened: POTABLE SUPPLY. FISHERIES.

(LOC) Probable Location and State of Material: METAL WILL SINK. MANY SALTS
INSOLUBLE. MAY GET DISPERSIONS.

(DRT) Soil Chemistry: SOIL ORGANIC MATTER, PH, AND PHOSPHATE CONTENT CONTROL
THE MOBILITY OF LEAD; EFFLUENT HOLDING 173 MG/L Pb^{+2} HAS BEEN NOTED TO
UNDERGO A 98% REDUCTION IN 3 INCHES OF SOIL (R174** 0001); LEAD
CONCENTRATIONS SHOULD NOT EXCEED 2 PPM AS THE SOLUBLE FORM IN THE SOIL
SOLUTION FOR PHYTO TOXIC CONSIDERATIONS; CALCIUM MAY COUNTERACT SOME LEAD
TOXICITY (R175** 0001); LEAD CONCENTRATIONS OF UP TO 1632 PPM IN THE TOP
12 INCHES OF SOIL CAN BE TOLERATED FROM THE STANDPOINT OF ACCUMULATION
AND BIOMAGNIFICATION (WWAEA2 0001).

(HOW) Water Chemistry: LEAD IS STABLE IN OXYGENATED WATER AS THE CARBONATE,
HYDROXIDE, OR; CARBONATE-HYDROXIDE SALTS. UNDER REDUCING CONDITIONS AND
IN THE PRESENCE OF SULFUR, LEAD SULFIDE WILL PREDOMINATE. LEAD IS LEAST
SOLUBLE AT PH 9-10 WITH CARBON DIOXIDE LEVELS AT 10-3 M. AT CARBON
DIOXIDE LEVELS OF 10-2 M SOLUBILITY IS LOWEST AT PH 8-10. AT PH 7-8,
SOLUBILITY OF TOTAL LEAD IS .001-.01 MG/L (JAWWAS 0013).

(DAT) Adequacy of Data: GOOD